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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/540,224	08/08/2006	William G. Tong	07252-025US1	3313

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EXAMINER	
WILDER, CYNTHIA B	
ART UNIT	PAPER NUMBER
1637	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/17/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/540,224	TONG, WILLIAM G.	
	Examiner	Art Unit	
	Cynthia B. Wilder, Ph.D.	1637	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 April 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) *8-16* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *4/2/2007*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Restriction is required under 35 U.S.C. 121 and 372.

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1.

In accordance with 37 CFR 1.499, applicant is required, in reply to this action, to elect a single invention to which the claims must be restricted.

Group I, claim(s) 1-7, drawn to a DNA microarray analysis method to detect signal.

Group II, Claims 8-11, drawn to a method for detecting concentration of metal ion.

Group III, claim(s) 12-14, drawn to a protein binding method to determine amount of protein in sample.

Group IV, claim(s) 15-16, drawn to apparatus.

2. The inventions listed as Groups I-III do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: The Groups I-III do not correspond to the same special technical feature because the broadest first named invention, namely, the apparatus as described in Group III is not "special" and does not provide a contribution over the prior art (see McFarland et al., Jan. 9, 2003). Additionally, the different invention does not correspond to the same special technical feature because the different inventions have different modes of operation resulting in different objectives. For example, the method of Group I utilizes a DNA microarray comprising an optical degenerate four-wave mixing system, whereas the method of Group III utilizes four wave mixing configuration to determine the amount of protein in a sample and the system of Group IV is drawn to an apparatus which can used in methods of screening libraries of various different materials, such as e.g., non-biological organic polymer materials, composite materials, catalytic antibodies and/or ligands. The different inventions are patentably distinct requiring different fields of search. A search of the different inventions would be burdensome to the Examiner due to non-overlapping subject matter. Additionally, the searches of the inventions of Groups I-IV are not co-extensive because methods which involves analysis of DNA as recited in Group I would not necessarily be applicable to a method for determining the concentration of a metal ion as recited in Group II or a method of determining the

amount of a protein as recited in Group III or a wave mixing apparatus as recited in Group III.

3. During a telephone conversation with Bing Ai on April 5, 2006 a provisional election was made with traverse to prosecute the invention of Group I, claims 1-7. Affirmation of this election must be made by applicant in replying to this Office action. Claims 12-16 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Claim Objections

4. Claims 1 and 3 are objected to because of the following informalities:

(a) The word "mciroarray" is misspelled. It is suggested amending the claim to recite "microarray". Appropriate correction is required.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 3-4 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

(a) Claim 3 is vague and confusing overall because it is unclear how the scanning step is performed "to place different locations within a DNA cell". Does this mean that the laser scans various areas within a single DNA cell or that multiple location are actually fixed or placed with a DNA cell by the laser. A clear interpretation of

Applicant's intent cannot be ascertained. Additionally, it is unclear how these steps relate to the steps of claim 1. Clarification is required.

(b) Claim 4 is vague and confusing especially in the final step of "hybridizing the substrate" because it cannot be determined in the final step how the "substrate is to be hybridized" or "what the substrate is hybridized to". One would expect that the step of "processing the substrate" as recited in the first step comprises hybridizing oligonucleotides to the substrate and then removing unbound target sequences as recited in the second step. There is however no nexus between the final step of hybridizing the substrates and the steps of processing and removing unbound target sequences therefrom. Accordingly, clear interpretation of Applicant's intent cannot be ascertained. Clarification is required.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

9. Claims 1-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over McFarland et al (US 2001/0033375, October 2001) in view of Sandstrom, P (US20030174324, effective filing date August 2000) and further in vie Weinberg et al (US 6248540, June 2001). Regarding claims 1 and 4, McFarland et al teach a method comprising a microarray comprising a plurality of components (0038-041 and 0050), connecting the microarray with an optical spectroscopic system wherein said system is an optical degenerate four-wave mixing (DFWM) configuration and screening each of the materials on the microarray by scanning the microarray and collecting and measuring the DFWM signal generated (0016, 0018, 0021, 0056-0057, and 0062). McFarland et al teach that the DFWM system is extremely sensitive and is effective to observe trace quantities of products (0062).

McFarland et al do not expressly teach that the microarray comprise a plurality of DNA cells. However, the patent broadly and indirectly suggest that oliogonucleotides may be components of the array and references Pirrung et al as support for method steps of processing microarrays comprising oligonucleotides (see paragraphs 0007-0008 and 0041 which teaches that the components of the microarray may be an element, a chemical, or a material of a mixture of elements and chemicals).

Sandstrorm provides a method for processing microarrays comprising oligonucleotides and methods for screening polymers on microarrays to detect

biological activity (0126-0142). Sandstrom et al teach wherein the microarray may be combined with optical signal detection techniques (0008-0021 and 0039-0053).

Weinberg et al teach a method for screening compounds attached to a microarray, wherein said screening of said array further comprise detection via optical spectroscopic techniques (col. 10, lines 12-26 and col. 27, lines 38-44), wherein said optical spectroscopic techniques include the use of a degenerate four wave mixing optical technique (col. 28, lines 52-57). Weinberg et al teach that DFWM relies on the absorption properties of the species being detected and can be thought of as being analogous to absorption spectroscopy, except that it is more sensitive, more selective and has higher spatial resolution (col. 34, lines 26-57).

One of ordinary skill in the art at the time of the claimed invention would have been motivated to combine microarray analysis comprising DNA with DFWM as taught by McFarland et al in view of Sandstrom and further in view of Weinberg et al based on the benefits taught by Weinberg et al that scanning and detecting array molecules via DFWM is more sensitive, more selective and has higher spatial resolution than other spectroscopic techniques.

Regarding claim 2, Sandstrom et al teach wherein the microarray comprise scanning a blank area between adjacent DNA cells to determine background noise (0019, 0053, 0107, 0148 and 0173)

Regarding claim 3, McFarland et al teach scanning different position of the microarray at different positions to determine inhomogenity within and between a molecule cell (0048, 0086-0088). Likewise, Sandstrom teaches scanning different areas

of a microarray to determine inhomogenity within and between molecule cells on the microarray (0019-0053 and 0126-0142).

10. Claims 5-7 are rejected under 35 U.S.C. 103(a) as being anticipated by McFarland et al in view of Sandstrom in view of Weinberg et al as previously described above and further in view of Tong (5600444, February 1997). Regarding claims 5-7, McFarland et al in view of Sandstrom and further in view of Weinberg et al teach a method comprising the use of a DNA microarray combined with DFWM for screening DNA cells. McFarland et al in view of Sandstrom and further in view of Weinberg et al differs from the instant invention in that the reference does not teach wherein the DFWM comprises backward scattering or forward scattering.

Tong teach a method and apparatus using two or three beam input laser beams in nonlinear degenerate four wave mixing arrangement for ultrasensitive analytical measurement of analyte. Tong et al teach wherein the DFWM system comprises backward scattering or forward scattering. Tong teaches that DFWM comprising backward scattering and forward scattering configuration are useful because of the phase conjugate property of the signal beam. Tong teaches that the phase conjugate property of the signal beam generated by an analyte in DFWM method has many potential applications including autocorrection of beam distortion or optical aberration (col. 13, lines 19-35).

In view of the foregoing, one of ordinary skill in the art would have been motivated to utilized DFWM having either backward scattering or forward scattering in

the DNA microarray analysis method taught by McFarland in view of Sandstrom and further in view of Weinberg et al based on the benefits taught by Tong that DFWM comprising backward scattering and forward scattering configuration are useful because of the phase conjugate property of the signal beam which has many potential applications including autocorrection of beam distortion or optical aberration.

Prior Art

11. Armstrong (US 2002/0015150, Feb. 2002) teach a medium, wherein said medium may be a solid matrix comprising nanoparticle aggregates comprising a plurality of DNA or DNA fragments and wherein said medium is doped using four wave mixing configuration, such DFWM. Armstrong teaches wherein DFWM are advantageous for remote sensing applications (0019-0021, 0022, 0024, 0029 and 0113).

Conclusion

12. No claims are allowed. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cynthia B. Wilder, Ph.D. whose telephone number is (571) 272-0791. The examiner can normally be reached on a flexible schedule.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gary Benzion can be reached on (571) 272-0782. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Cynthia Wilder

Cynthia B. Wilder, Ph.D.
Patent Examiner
Art Unit 1637

4/10/2006